

Hosts

- Eastern white pine (*Pinus strobus*)
- Other five-needled pines

Alternate Hosts

- Currants
- Gooseberry
- Other *Ribes* species

Damage Potential

- Moderate–high

Symptoms and Signs

On Pine

Year-round:

- Chlorotic needles, stunted growth
- Chlorotic, dead, or dying tree tops or branches
- Yellow-bordered cankers on trunk or 3- to 4-year-old branches; oozing resin or rodent feeding may be apparent
- Resin flow on main trunk that hardens to white, orange, or brown

Early spring:

- Orange-yellow blisters breaking through cankered bark to release spores

Late spring to early summer:

- Sticky, yellow fluid produced from yellow-brown blister on canker; fluid will blacken after a short time

Fall:

- Patches of yellow or brown bark on young growth; area may be swollen but progresses to spindle-shaped canker by second year of infection

On *Ribes* Species

Summer:

- Orange spores on underside of leaf; upper surface may have yellow, diffused spots

Late summer to early fall:

- Brown, hairlike projections on underside of leaf



Figure 1. Flagging as a result of cankers girdling a branch. Courtesy of John W. Schwandt, USDA Forest Service, Bugwood.org (#1241718)

Causes of Similar Symptoms

- Fungal root rots
- Pales weevil
- Pine root collar weevil

Identification

White pine blister rust is the only stem rust of five-needled pines. It requires an alternate host (*Ribes* species) for new infections to occur on pine.

Early detection can be difficult due to very subtle symptoms during the first year of infection. First, a small, yellow or red spot appears on the needle at the site of infection and eventually the needle may die as the fungus grows into the bark tissue. The newly infected bark tissue will become brown with a yellow border surrounding a section of dead needles. The stem may be slightly swollen.

During the second year of infection and beyond, long, elliptical-shaped cankers develop on branches and the main trunk as the fungus advances. Cankers can eventually girdle the branch, which results in “flagging” (Fig. 1), or they can girdle the trunk, killing all growth above the canker. Yellowish-green bark tissue may be visible around the canker. Blisters (0.25 inch, 3 mm across), spores, and resin flow all arise from the canker area. Rodent feeding may be evident around this area as well.

Biology and Life Cycle

The life cycle of white pine blister rust may take 3–6 years to complete. It begins in late summer or early autumn when basidiospores from the alternate host (*Ribes* species) are wind and rain dispersed, entering the pine needle through the stomata (Fig. 2). Basidiospores may be carried in wind currents for up to a mile.

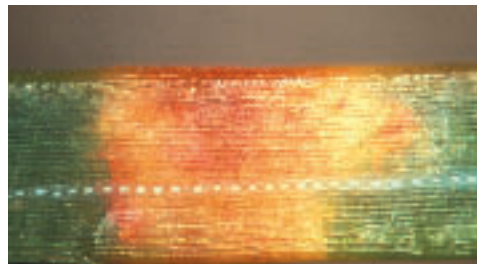


Figure 2. Yellow/red infection site on a needle. Courtesy of USDA Forest Service Ogden Archive, Bugwood.org (#1467424)

WHITE PINE BLISTER RUST

Cronartium ribicola
J. C. Fisch



Elliptical cankers covered with yellow blisters that release infectious spores to be carried away by the wind. Courtesy of Tracey Olson, PDA



Figure 3. Elliptical cankers formed after the first year of infection. *Courtesy of Joseph O'Brien, USDA Forest Service, Bugwood.org (#5061066)*



Figure 4. Mass of powdery, yellow spores covering the surface of the canker (spring). *Courtesy of Tracey Olson, PDA*



Figure 5. Sticky, yellow liquid exuded by a canker just before hardening off. *Courtesy of Joseph O'Brien, USDA Forest Service, Bugwood.org (#5042098)*

The fungus grows into the bark tissue at a rate of 5–6 inches (12.5–15.0 cm) per year and begins to form cankers after the first year of infection (Fig. 3). In spring, 3–4 years after the initial infection, pale yellow or cream-colored blisters (aecia) rupture through the bark of active cankers (Fig. 4). They release powdery, yellow spores (aeciospores) that are carried in the wind over long distances to the alternate host and cause infection. The aeciospores can only infect *Ribes* species. After the spores are released, the cankered area on the pine remains swollen and roughened. In summer, the sticky, yellow fluid that exudes from the site hardens and leaves small, brown-rust-colored scars (Fig. 5).

On the alternate host, the aeciospores enter the stomata of the leaf during wet weather. Diffused, yellow spots become visible on the upper leaf surface soon after infection occurs. Within a few weeks, pustules form on the leaf underside and release spores that repeatedly infect the same plant or other *Ribes* in the vicinity (Fig. 6). This repeating stage serves to increase the levels of inoculum. In late summer, small, brown, hairlike structures appear on the underside of the leaf. Eventually, basidiospores are produced and wind dispersed back to susceptible pines in the vicinity.



Figure 6. Underside of *Ribes* leaf with fruiting bodies. *Courtesy of Robert L. Anderson, USDA Forest Service, Bugwood.org (#0355052)*

Monitoring and Management Strategies

Plantation Establishment

- Northeastern Pennsylvania is especially prone to white pine blister rust.
- Do not plant white pine in low-lying areas where cool, moist air is likely to settle.
- Do not plant white pine species if there is an abundance of alternate hosts (*Ribes* spp.) in the surrounding area.

- Consider removing alternate host material from within 1,000 feet of white pine plantings.

Preseason

- Tag trees suspected to have white pine blister rust to check for blisters in mid-April.

Growing Season

- Scout trees for blisters in mid-April.
 - Randomly select at least 50 trees that are 5–10 years of age.
 - Look for yellow or orange blisters on branches and trunks.
 - Also scout tagged trees.
- If 10 percent or more of sampled trees are infected:
 - Prune/remove cankers from trees before infection reaches trunk.
 - Control alternate host before August.
- Remove and destroy trees with trunk infections.
- Inspect trees throughout the year for cankers.
- At the end of the season, evaluate results and update records.

Control Options

Biological

- No recommendations are available at this time.

Mechanical

- Prune and destroy all branches with cankers.
- Remove and destroy all alternate host plants in and around plantation within a minimum of 1,000 feet.

Biorational

- No recommendations are available at this time.

Chemical

- Apply an appropriate fungicide in late summer to protect pines from infection from basidiospores released by an alternate host.
- Apply an appropriate herbicide to control the alternate host.

Next Crop/Prevention

- Inspect plants/nursery stock; buy from a reputable company.